

Appl. No.: 10/072,789
Amdt. Dated 08/11/2005
Reply to Office action of May 24, 2005

1. (currently amended) A structural member, comprising:
a first region comprising at least a portion of the exterior of the structural member, said first region being characterized by comparatively high operational stress; and
a second region comprising at least a portion of the exterior of the structural member, said second region having a more refined grain structure than other portions of the structural member, said second region being formed by at least one of partial-penetration and full-penetration mixing and wherein said second region at least partially encompasses said first region to thereby selectively improve the strength, toughness and fatigue resistance of the structural member in said first region; and ~~wherein the structural member has a tubular configuration wherein the structural member defines a first set of regions having refined grain structures and a second set of regions having refined grain structures, said first set of regions being spaced apart and generally parallel, said second set of regions being spaced apart and generally parallel, and wherein said first set of regions intersects said second set of regions to thereby define a plurality of containment zones.~~

2. (original) A structural member as defined in Claim 1 further comprising a threaded opening at least partially contained within said second region.

3. (original) A structural member as defined in Claim 1 wherein the structural member is formed of materials selected from the group consisting of steel, stainless steel, magnesium, magnesium-based alloys, brass, copper, beryllium, beryllium-copper alloys, aluminum, aluminum-based alloys, aluminum-zinc alloys, aluminum-copper alloys, aluminum-lithium alloys, and titanium.

Claims 4-6 (canceled).

7. (original) A structural member as defined in Claim 1 wherein the structural member defines a plurality of regions having refined grain structures, said regions being spaced apart and generally parallel.

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Claim 8 (canceled).

9. (currently amended) A structural assembly, comprising:
a plurality of structural members, said plurality of structural members being secured together to form the structural assembly; and
wherein at least one of said plurality of structural members defines a first region comprising at least a portion of the exterior of said at least one structural member, said first region being characterized by comparatively high operational stress, and a second region comprising at least a portion of the exterior of said at least one structural member, said second region having a more refined grain structure than other portions of said at least one structural member, said second region being formed by at least one of partial-penetration and full-penetration mixing and wherein said second region at least partially encompassing said first region to thereby selectively improve the strength, toughness and fatigue resistance of said at least one structural member in said first region; and wherein said plurality of structural members are secured together to form the frame of an aircraft.

10. (original) A structural assembly as defined in Claim 9 wherein said at least one structural member defines a threaded opening at least partially contained within said second region.

11. (original) A structural assembly as defined in Claim 9 wherein said plurality of structural members are formed of materials selected from the group consisting of steel, stainless steel, magnesium, magnesium-based alloys, brass, copper, beryllium, beryllium-copper alloys, aluminum, aluminum-based alloys, aluminum-zinc alloys, aluminum-copper alloys, aluminum-lithium alloys, and titanium.

12. (previously presented) A structural assembly as defined in Claim 9 wherein said at least one structural member has an I-shaped configuration having opposed end portions and a web interconnecting the end portions, and wherein said second region includes at least a portion of said web.

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13. (previously presented) A structural assembly as defined in Claim 12 wherein said second region includes at least a portion of at least one of said opposed end portions.

14. (original) A structural assembly as defined in Claim 9 wherein said at least one structural member has a tubular configuration.

15. (original) A structural assembly as defined in Claim 9 wherein said at least one structural member defines a plurality of regions having refined grain structures, said regions being spaced apart and generally parallel.

16. (currently amended) A structural assembly as defined in Claim 9 wherein said at least one structural member defines a first set of regions having refined grain structures and a second set of regions having refined grain structures, said first set of regions being spaced apart and generally parallel, said second set of regions being spaced apart and generally parallel, and wherein said first set of regions intersects said second set of regions to thereby define a plurality of containment zones.

Claims 17-31 (cancelled).

32. (currently amended) A structural member, comprising:
a first region characterized by comparatively high operational stress, said first region comprising a threaded opening; and
a second region ~~having a more refined grain structure than other portions of the structural member, comprising at least a portion of the exterior of the structural member, said second region having a more refined grain structure than other portions of the structural member, said second region being formed by at least one of partial-penetration and full-penetration mixing, said second region at least partially encompassing said first region to thereby selectively improve the strength, toughness and fatigue resistance of the structural member in said first region; and~~
a threaded opening at least partially contained within said second region.

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33. (previously presented) A structural member as defined in Claim 32 wherein the structural member is formed of materials selected from the group consisting of steel, stainless steel, magnesium, magnesium-based alloys, brass, copper, beryllium, beryllium-copper alloys, aluminum, aluminum-based alloys, aluminum-zinc alloys, aluminum-copper alloys, aluminum-lithium alloys, and titanium.

34. (previously presented) A structural member as defined in Claim 32 wherein the structural member has an I-shaped configuration having opposed end portions and a web interconnecting the end portions, and wherein said second region includes at least a portion of said web.

35. (previously presented) A structural member as defined in Claim 34 wherein said second region includes at least a portion of at least one of said opposed end portions.

36. (previously presented) A structural member as defined in Claim 32 wherein the structural member has a tubular configuration.

37. (previously presented) A structural member as defined in Claim 32 wherein the structural member defines a plurality of regions having refined grain structures, said regions being spaced apart and generally parallel.

38. (previously presented) A structural member as defined in Claim 32 wherein the structural member defines a first set of regions having refined grain structures and a second set of regions having refined grain structures, said first set of regions being spaced apart and generally parallel, said second set of regions being spaced apart and generally parallel, and wherein said first set of regions intersects said second set of regions to thereby define a plurality of containment zones.

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39. (previously presented) A structural member, comprising:
a first region characterized by comparatively high operational stress; and
a second region having a more refined grain structure than other portions of the structural member, said second region at least partially encompassing said first region to thereby selectively improve the strength, toughness and fatigue resistance of the structural member in said first region and wherein the structural member has an I-shaped configuration having opposed end portions and a web interconnecting the end portions, and wherein said second region includes at least a portion of said web.

40. (previously presented) A structural member as defined in Claim 39 further comprising a threaded opening at least partially contained within said second region.

41. (previously presented) A structural member as defined in Claim 39 wherein the structural member is formed of materials selected from the group consisting of steel, stainless steel, magnesium, magnesium-based alloys, brass, copper, beryllium, beryllium-copper alloys, aluminum, aluminum-based alloys, aluminum-zinc alloys, aluminum-copper alloys, aluminum-lithium alloys, and titanium.

42. (previously presented) A structural member as defined in Claim 39 wherein said second region includes at least a portion of at least one of said opposed end portions.

43. (previously presented) A structural member as defined in Claim 39 wherein the structural member defines a plurality of regions having refined grain structures, said regions being spaced apart and generally parallel.

44. (previously presented) A structural member as defined in Claim 39 wherein the structural member defines a first set of regions having refined grain structures and a second set of regions having refined grain structures, said first set of regions being spaced apart and generally parallel, said second set of regions being spaced apart and generally parallel, and wherein said

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first set of regions intersects said second set of regions to thereby define a plurality of containment zones.

45. (new) A structural member as defined in Claim 1 wherein the structural member has an I-shaped configuration having opposed end portions and a web interconnecting the end portions, and wherein said second region includes at least a portion of the web.

46. (new) A structural member as defined in Claim 45 wherein said second region includes at least a portion of at least one of said opposed end portions.

47. (new) A structural member as defined in Claim 1 wherein the structural member has a tubular configuration.